

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1, 3-26, 29-39, 41-52, 55-56, 59-62, 65 and 78-92 are presently active in this case, Claims 3, 14-19, 39, 41-50 are canceled, and Claims 1, 34-37, 78-79 and 81 amended by way of the present Amendment.

In the outstanding Official Action, Claims 81 and 82 were rejected under 35 U.S.C. § 112, first paragraph; Claim 78 was rejected under 35 U.S.C. § 112, second paragraph; Claims 1, 3-7, 11-13, 20-21, 23, 31-33 and 52 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Publication 2003/0176060 to Doan et al.; Claims 8 and 10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Doan et al. in view of U.S. Patent Publication 2001/0054769 to Raaijmakers et al.; Claim 9 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Doan et al. in view of Raaijmakers et al., and further in view of U.S. Patent Publication 2003/0031793 to Chang et al.; Claims 22 and 34-38 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Doan et al. in view of U.S. Patent No. 6,607,973 to Jeon; Claim 24 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Doan et al. in view of U.S. Patent No. 6,572,705 to Suntola et al.; Claims 25-26, 52 and 79-80 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Doan et al. in view of U.S. Patent No. 6,818,517 to Maes; Claims 59-60 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Doan et al. in view of U.S. Patent Publication 2002/0182320 to Leskela et al.; Claims 61 and 62 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Doan et al. in view of U.S. Patent Publication 2003/0049372 to Cook et al. and Claim 78 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Doan et al. in view of U.S. Patent No. 6,946,336 to Pang et al.

First, Applicants wish to thank Examiner Stouffer and Supervisory Patent Examiner (SPE) Meeks for the November 29, 2006 personal interview at which time the outstanding issues in this case were discussed. During the interview, Applicants presented amendments and arguments substantially as indicated in this response. While no agreement was reached, the Examiners indicated that full consideration would be given to the amendments and arguments contained herein upon formal filing of this response.

Regarding the rejection of Claim 78 under 35 U.S.C. § 112, second paragraph, Applicants have amended this claim to overcome the rejection.

With regard to the rejection under 35 U.S.C. § 112, first paragraph, the outstanding Office Action takes the position that the limitation of "substrates being placed only from a middle surface to a lower surface of the tier substrate holder" is not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventors were in possession of the invention at the time the present application was filed. Applicants respectfully submit however, that this limitation is adequately described under standards established by M.P.E.P. § 2163 and case law relating to the 112, first paragraph written description requirement.

First, the MPEP states

2163.02 Standard for Determining Compliance With the Written Description Requirement

...The subject matter of the claim need not be described literally (i.e., using the same terms or *in haec verba*) in order for the disclosure to satisfy the description requirement.

In addition, it is settled law that "[D]rawings alone may provide a 'written description' of an invention as required by § 112."¹ In other words, "[m]atter disclosed in the drawing alone, and not described in the specification as filed, has been held sufficient to support valid

¹ Vas-Cath In. v. Mahurkar, 935 F.2d 1555, 1565, 19 U.S.P.Q.2D 1111, 1118 (Fed. Cir. 1991).

claims.² In such cases where drawings alone are relied upon to meet the written description requirement, the enquiry "is what the drawing in fact discloses to one skilled in the art."³

As discussed in the response filed June 29, 2006, Figures 10 and 11 (and corresponding text) of Applicants' specification as originally filed show that process results are substantially constant for substrates positioned between the middle position and lower position in a tier substrate holder. Thus, contrary to the position taken in the Office Action, the original disclosure does provide "a reason why one skilled in the art may (place substrates only between the middle and bottom substrate holders)". That is, Applicants' disclosure as originally filed conveys with reasonable clarity to those skilled in the art that Applicants were in possession of the invention as of the filing date. Further, as noted in the November 29th interview, the Office Action does not consider this disclosure in determining the 112, first paragraph issue. Consequently, the rejection based on failing to meet the written description requirement of 35 U.S.C. § 112, first paragraph should be withdrawn.

Turning now to the merits, in order to expedite issuance of a patent in this case, Applicants have amended independent Claims 1, 79 and 81 to clarify the patentable distinctions of the present invention over the cited references. Specifically, Applicants have amended these claims to recite that the metal containing film is a film comprising HfO₂. This amendment is made in response to the Examiners' indication in the November 29th interview that the data in Figures 10, 11 and 13 of Applicants' specification must correlate to the claimed subject matter in order for the data to show "criticality." Claims 1, 79 and 81 have been further amended to clarify that the critical parameter of each respective claim improves uniformity of processing among the plurality of substrates. Based on these amendments, Applicants submit that the original application shows criticality of the claimed parameters of

² In Re Wolfensperger, 49 C.C.P.A. 1075, 1082, 302 F.2d 950, 956, 133 U.S.P.Q. 537, 542 (1962).

³ In Re Wolfensperger, 49 C.C.P.A. 1075, 1081, 302 F.2d 950, 955, 133 U.S.P.Q. 537, 542 (1962).

Claims 1, 79 and 81, which are not disclosed or rendered obvious by the cited references as discussed below.

First, Applicants' Claim 1 recites "heating the substrates to a temperature of approximately 180°, the temperature being selected to improve uniformity of processing among the plurality of substrates . . . and repeating the flowing process until a film comprising HfO₂ with desired film properties is formed on the substrates." As discussed in the November 29th interview, Figure 13 of Applicants' specification as originally filed shows that batch deposition of a HfO₂ film at approximately 180°C provides a WIW uniformity that is substantially similar among the top, center and bottom wafers in a tier wafer processing system. Thus, Applicants' original specification provides evidence showing criticality for 180°C in performing the claimed batch type deposition process to achieve uniformity among the batch.

Claim 79 recites "flowing a pulse of a reactant gas in the process chamber, wherein a total time of a cycle of flowing a pulse of hafnium-containing precursor and flowing a pulse of reactant gas in the process chamber is less than 30 seconds and is repeated less than 20 times, wherein the time of a cycle and repeat amount is selected such that a film comprising HfO₂ with desired film properties is formed on the substrate with improved uniformity among the plurality of substrates." As discussed in the November 29th interview, Figure 10 of Applicants' specification as originally filed shows that an exposure time of less than 30 seconds provides a HfO₂ film thickness among top, middle and bottom wafers in the batch to be closer in uniformity than for exposure times more than 30 seconds, while also providing a WIW uniformity that is acceptable. Further, Applicants' original Figure 11 shows that depositing a HfO₂ film using a number of cycles less than 20 provides close uniformity in thickness among top, middle and bottom wafers, while providing a WIW uniformity that is acceptable. Thus, Figures 10 and 11 of Applicants' specification provide evidence showing

the criticality of the claimed exposure time and number of cycles for uniformly depositing a HfO₂ film across a batch

Of the nine references cited in the Office Action, only the cited reference to Doan discloses depositing HfO₂ films on a substrate in a batch type processing system. Thus, the outstanding Office Action cites Doan as a primary reference in rejecting all claims of the present application. However, the Office Action acknowledges that Doan does not disclose the 180°C feature,⁴ exposure time⁵, or cycle number⁶ parameters above. Instead, the Office Action concludes that these parameters are not critical and/or that it would be obvious to optimize these parameters in the prior art. However, as discussed above, Applicants' claims have been amended to clarify critical parameters which are supported by data in the specification as originally filed.

Further, Applicants note that a parameter must first be recognized in the prior art as a result effective variable before the determination of optimum or workable ranges of the variable might be characterized as routine experimentation.⁷ While Doan and other cited references disclose the parameters of temperature, exposure time and cycle number, none of these references disclose that these variables can be varied in order to achieve some desirable result. In this regard, Applicants note that it is not the simple ability to vary a parameter that makes it obvious to optimize, but rather a disclosure in the prior art indicating that it is desirable to vary some parameter for a particular reason. The only indication on record of varying the parameters of temperature, exposure time and cycle number to achieve a desired result is provided by Applicants' specification as a originally filed which includes data indicating that variation of these parameters provides improved uniformity of processing across a batch of substrates. Thus, while the process parameters of Applicants' independent

⁴ See Office Action at pg. 4, line 12 – pg. 5, line 5.

⁵ See Office Action at pg. 7, line 19 – pg. 8, line 4.

⁶ See Office Action at pg. 8, line 11-22.

⁷ See In re Antonie, 559 F2nd 618, 195 USPQ. 6 (CCPA 1977).

claims are known process parameters, one of ordinary skill in the art would not be motivated to optimize these parameters without the benefit of Applicants' disclosure.

For the reasons discussed above, Applicants' Claims 1, 79 and 82 patentably define over the cited references. As the remaining claims in this case depend from one of these independent claims, the remaining dependent claims also patentably define over the cited references.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore respectfully requested.

Respectfully submitted,

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